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"Phytochemical And Physiochemical Analysis Of Udumbar Jal (Sap Of Root Of Ficus racemosa Linn.)"

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Abstract: **Panchavalkala drugs, Ksheere Vrikshas from Kashaya Skanda are one of the important and ancient sources of long lifespan herbs. There was not much data available on** its properties, actions, **formulations,** dose, time of administration and various preparations of these drugs**.** Its mode of action in various shades of human lifestyle is really a matter of research work with lots of scope to revile unknown facts scientifically. Udumbara Jala **is used** in treatment **by Ayurvedic Physicians** & folklore's **with very good results in condition like** Madumeha, upadansha, bhasmak etc., Curiosity to know about the working principals & mode of action in such conditions made the drug more fascinating & interest to explore its pharmacodynamic & pharmacokinetics. The present study deals with collection authentication & standardization of Udumbara jala (*Ficus racemosa* Linn.) & its analytical study (Laboratory study). Udumbara jala was collected from genuine natural source by using Classical method mentioned in the Ayurvdic Texts and was send within 24 hrs for Analysis. Udumbara was authenticated at central research facility, Analytical Laboratory, Belgavi. The sample was authenticated as *Ficus racemosa* Linn (Family: - Moraceae). The findings like presence of Carbohydrates, Proteins, Minerals & absence of Heavy Metals increases the scope for further research, also there was no presence of any Microbial contamination if collected properly.

***Index Terms* – Udumbara Jala, Ayurveda, Dravyaguna, Sap of Root.**

I. INTRODUCTION

Dravyaguna is in-separable branch of Ayurveda which deals with study of such various dravyas, herbs & its properties, actions, dose, time of administration and various preparations of these drugs. Dravyaguna Vigyan has not evolved spontaneously. Through centuries, the science has gradually developed with new experiences and facts getting incorporated, and old principles which could not with stand the test of authenticity, being discarded This science has always been enriched by new validated principles and experimentations and an organized presentation of experiences.

For the treatment part Ayurveda has used infinite dravyas by virtue of intellect and experience to achieve health, happiness and diminish his sorrows. Human beings possessed marked similarity with nature & has tried to make his life happier by using many dravyas as provided by the nature. But human intellect and intellectual efforts never allowed him to be satisfied. Remedies (therapeutic agents) keep on being increasing in pace with ever increasing medical needs.

II. NEED OF STUDY

Panchavalkal drugs were one of the very potent and largely available categories that served the mankind in many ways. Its use in day today life, diet, medicines, spiritual importance in various holy procedures was successfully & authoratively used since ancient times. Its mode of action in various shades of human lifestyle is really a matter of research work with lots of scope to revile unknown facts scientifically. The main reason for selecting this topic was use of medicine by renowned practitioners from field of Ayurveda & folklore's evidence regarding the use of Udumbara Jala in treatment of Madumeha, upadansha, bhasmak etc., the plant Ficus racemosa Linn. have the various pharmalogical activities like antioxidant, cardio-protective, mosquito larvicidal, gastro-protective. Curiosity to know about the working principals & mode of action in such conditions made the drug more fascinating & interest to explore its pharmacodynamic & pharmacokinetics.

As the reference of Udumbara Jala was not found in classical texts but still it is successfully use by traditional Ayurvedic practitioners by the permission of ancient scholars to experiment & use various drugs in various formats after proper study of drug & diseases opens the scope for scientific research & hence the study was chosen as a topic of research, where details regarding its collection methods, properties, tests etc. were studied in detail under the title **"PHYTOCHEMICAL AND PHYSICOCHEMICAL ANALYSIS OF UDUMBARA JALA (SAP OF ROOT OF Ficus racemosa Linn.)"**

III. AIM & OBJECTIVES

AIM: -

The main Aim of study was "To Analyze PHYTOCHEMICAL and PHYSICOCHEMICAL properties of UDUMBARA JALA (SAP of ROOT OF Ficus racemosa Linn.)"

OBJECTIVES: -

While approaching towards the Aim of the study it was necessary to have a watchful vision on various associated parameters regarding the study topic. Objectives were as follows: **Population and Sample** -

1. To collect literary references of Udumbara jala from ancient Ayurvedic texts as well as from recent Ayurvedic texts.
2. To collect references about collection method of Udumbara Jala.
3. To collect, authenticate & standardize self-collected Udumbara Jala.
4. To study – Organoleptic, Phytochemical & Physicochemical properties of Udumbara Jala.

Drug Discreption

Nirukti of Udumbara: -

"EssÉÉ…biÉqÉqoÉUÇ rÉåIÉ CÌiÉ ESÒqoÉU:|"

Udumbara, the plant which infringement / breach the limitations of sky & one which grows high.

Botonical Name: -
Ficus racemosa Linn; **Syn.: -** *Ficus glomerata. Roxb*

Ficus – Old name used by Horaee, Cicaro & others.
racemosa – having an inflorescence with a long undivided axis or glomerata compactly clustered into a round heap or head (Linn.) (Roxb.)

Classification of Udumbara as per Ayurveda: -

i. Cause effect Relationship: - Karya Dravya.
ii. Living/Non-Living: - Chetana Dravya
iii. Constitution: - Vayu, Prithvi, Aap.
iv. Origin: - Audbhida, Vanaspati.
v. Usage: - Aushadi Dravya.
vi. Morphology: - Vruksha.
vii. Life Span: - Bahuvarshayu.
viii. Rasa (BHP): - Madhur, Kashaya.
ix. Vipaka (BHP): - Madhur.
x. Veerya(BHP): - Sheeta.
xi. Action on Dodha (BHP): - Kapha Pittaghna.
xii. Rogaghnata (BHP): - Vranaropaka & Vranasodhaka, Vednasthapan, Daha-prashamana, Raktavikara, Raktapitta, Raktaatisaar.
xiii. Karma (BHP): - Varnya, Stambhana, Mutrasangrahaniya.
xiv. Gana: - Ch. Su - Mutrasangrahaniya, Kashayaskandha;
Su. Su - Nyagrodhadi;
BHP - Panchawalkal, Kshirivruksha

PARTS USED: -
Bark, Fruit, Latex & Root, Kshira, Udumbara Jala (Sap of Root)

I. RESEARCH METHODOLOGY

The present study deals with collection authentication & standardization of Udumbara jala (*Ficus racemosa* Linn.) & its analytical study (Laboratory study). For any drug to be utilized, its safety, quality & efficacy are important parameters that are to be taken into account Udumbara is an ancient drug used by Ayurvedic practitioners from thousands of years in the traditional system of medicines from Vedic era to till date. Safety of the drug is therefore time tested.

To ensure quality & efficacy the study was divided in 3 stages: -

1. Collection of Sample.
2. Quality assurance (Authentification & Standardization).
3. Analytical Study

3.1 Materials

- Udumbara Jala (Sap of Root of *Ficus racemosa*)
- Essential Research Instruments.
- Tools for collection of Udumbara Jala.

3.2 Collection of Udumbara Jala

Udumbara jala was collected from genuine natural source at Kodoli, MAHARASHTRA, INDIA. In the month of April. Method used were adopted keeping in mind the basic principles of drug collection mentioned in Ayurveda, specifically according to Acharya Charak & proper Sangrahana Kala as stated in ancient Ayurvedic texts.

According to "Acharya Charak" –

"iÉåwÉÉÇ zÉÉZÉÉmÉsÉÉzÉqÉÍcÉUmÉëÂRÇû uÉwÉÉïuÉxÉliÉrÉÉåaÉëÉï½Ç,
aÉëÏwqÉå qÉÔsÉÉÌlÉ ÍzÉÍzÉUå uÉÉ zÉÏhÉïmÉëÃRûmÉhÉÉïlÉÉÇ,
zÉUÌS iuÉM MülS¤ÉÏUÉÍhÉ, WåûqÉliÉå xÉÉUÉÍhÉ, rÉjÉiÉÑïmÉÑwmÉTüsÉÍqÉÌiÉ ||"
-cÉ. Mü. 1/10.

As per above stated shloka Udumbara root & Udumbara Jala were collected from genuine source in Grishma Ritu (April & May). After a watchful study from various texts from Ayurveda it was found that collection of roots was described in some texts, but there were no proper guidelines given for collection of Sap of Root. It was discussed with various experts from the field of Dravyaguna, Botany & on field experts & present collection method was finalized for collection.

3.3 The process of collection of Udumbara Jala was as follows

- The species of Udumbara was identified in the surroundings of Kodoli. Tree was inspected properly from all dimensions to rule out any abnormalities.
- Root was identified for collection of samples.
- External roots were not more precise so it was preferred to dig & identify healthy root for collection of samples.
- Soil was dig precautious without causing any harm to the root with approximate dimension of dig whole around 2ft x 2 ft x 2 ft.
- Proper space was available for swift movements and to maintain aseptic precautions to avoid infection of sample, root was washed thoroughly to avoid adulteration of soil & foreign matters.
- After washing the root, a drape paper was placed in a pit & a collecting vessel was kept under the root.
- Section of root was cut and was covered with an 8 fold - clean cotton cloth; cloth was tied with a knot around 2 inches above the dripping tip of root. The whole concept helped in filtration process of sample.
- The whole setup was further covered with drape paper to avoid inputs of adulterations in form of soils, foreign particles, dust etc.
- Sap of root i.e., Udumbara Jala was collected in the vessel after overnight time span.
- Udumbara jala i.e., sap of root was stored in a dry, non-contaminated, plastic container.
- Collected sample was further send to lab investigations within 24 hrs to avoid alteration in properties & readings or various tests of the sample

Fig. 01 Udumbara Tree (Ficus racemose Linn.)

Fig. 02 Udumbara Tree with Roots

Fig. 03. Instruments Used for Collection of Sample

Fig. 04. Root of Udumbera Chosen for Study

Fig. 05. Udumbar Root after diging a Pit

Fig. 06. Cutting of Udumbara Root

Fig 07. Selection of Root for Collection Of Udumbara Jala

Fig. 08. Drops of Udumbara Jala Dripping from Root

Fig. 09. Precautions taken to avoid Contamination & Impurities

Fig. 10. Method used for collection of Sample taking aseptic precautions to avoid Contamination at Local Level

3.4 Authentication

Udumbara was authenticated at central research facility, Analytical Laboratory, Belgavi. The sample was authenticated as *Ficus racemosa* Linn (Family: - Moraceae)

3.4.1 Standardization according to API guidelines

Standardization of Udumbara Jala was carried out in following way:-

3.4.1.1 Botanical Standardization

- **Botanical Name**: - *Ficus racemosa* Linn.
- **Family**: - Moraceae.
- **Parts used**: -Udumbara Jala.

3.4.1.2 Organoleptic evaluation

Organoleptic Characters means "Testing with the help of Sense Organs".

- Shape & Size for eyes.
- Surface & Texture with skin.
- Odor with Nose.
- Fracture with eyes, ears & skin.
- Taste with tongue

3.4.2 Physicochemical Analyses

Physicochemical analyses of Udumbara Jala were done with the help of following tests:-

3.4.2.1 Determination of pH value: -

The pH value of a liquid is determined potentiometrically by means of the glass, electrode and a suitable pH meter.

Sample: - Udumbara Jala.

3.4.2.2 Determination of Specific Gravity: -

Specific gravity: The specific gravity of a liquid is the weight of a given volume of the liquid at 250 (unless otherwise specified) compared with the weight of an equal volume of water at the same temperature, all weighing being taken in air**.**

Sample: - Udumbara Jala.

3.4.2.3 Determination of Total Solid: -

Sample: - Udumbara Jala.

3.4.2.4 Determination of Turbidity: -

Sample: - Udumbara Jala.

3.4.2.5 Determination of Refractive Index: -

Sample: - Udumbara Jala.

3.4.2.6 Determination of Chromatography (TLC): -

Sample: - Udumbara Jala.
Materials: - Pre coated TLC plates (silica) of thickness 0.20 mm, 20 x 20 cm, applicator, glass chamber, oven,
Solvent System: - Toluene: Ethyl Acetate: Formic Acid
Spraying agent: - Anisaldehyde Sulphuric acid

3.4.3 Phytochemical Analyses: -

Phytochemical analyses of Udumbara Jala were done by following tests: -

3.4.3.1 Total Carbohydrates: - Estimation of Carbohydrates by Fehling test method:-

Sample: -Udumbara Jala.

3.4.3.2 Test for Proteins: -

Sample: -Udumbara Jala.

3.4.3.3 Estimation of Amino Acids by Ninhydrin method: -

Sample: -Udumbara Jala.

3.4.3.4 Estimation of the Concentration of elements (Calcium, Sodium, Potassium) by Flame photometer: -

Sample: -Udumbara Jala.

3.4.3.5 Estimation of Iron by Volumetric method: -

Sample: -Udumbara Jala.

3.4.3.6 Estimation of Heavy Metals (As, cd, pb, Hg): -

Sample: -Udumbara Jala.

3.4.4 Microbial Contamination

Microbial Contamination of Udumbara Jala were done by following tests: -

3.4.4.1 Estimation of Total fungal count by Calometric method using SCDM & MHA & SDA media: -

Sample: -Udumbara Jala.

3.4.4.2 Estimation of E-coli by Calometric method using SCDM & MHA & SDA media: -
Sample: -Udumbara Jala.

IV. OBSERVATIONS

Observations were divided in 4 parts: -

1. Pharmacognostic Observations,
2. Physico-Chemical Observations,
3. Phyto-chemical Observation,
4. Microbial Contamination.

Udumbara Jala (Sap of Root): -
As it was study drug and no authentic previous data was found for reference, more precautions were taken to get correct & up to the mark data for further research work.

4.1 Organoleptic characters of Udumbara Jala (Sap of Root): -

- **Sample State: -** Liquid,
- **Colour: -** Colourless,
- **Appearance: -** Very mild turbid,
- **Taste: -** Tasteless,
- **Odour: -** Odourless,
- **Touch / Temperature: -** Cool (97.80 f)

4.2 Physico-chemical Observations of Udumbara Jala: -
Table 4.1: Physico-chemical Observations of Udumbara Jala

Sr. No	Test Name	Result Obtained
1	**Description**	Colorless liquid: Odour Characteristic : Tasteless
2	**pH**	7.58
3	**Specific gravity**	0.9755 gm/ml
4	**Total solid content**	12.42 %
5	**Turbidity**	1.5 NTU
6	**Refractive Index**	1.3345
7	**T.L.C**	Done

Table 4.2: Thin Layer Chromatography of Udumbara Jala

Sr.no.	Name of Sample	Result Obtained
1	**Udumbara Jala**	Done
TLC: **Extraction:** Water Extract **Adsorbent used:** Silica gel G60 F254 **Mobile phase:** Toluene : Ethyl Acetate : formic acid (5 : 5: 1)		
Iodine chamber: one Spots were observed.		

Spot	RF Value	Colour
1 st	0.19	Yellow

Fig. 11. Thin Layer Chromatography of Udumbara Jala

4.3. Phytochemical Observation of Udumbara Jala (Quantitative Assessments): -

Table 4.3 Quantitative Assessments

Sr. No.	Test Name	Result Obtained %
1	Description	Colorless liquid ; odour
2	Minerals	0.0038 %
3	Carbohydrates	0.021 %
4	Amino Acid	0.138 %
5	Proteins	0.138 %
6	Arsenic As As	< 0.01 ppm
7	Cadmium As Cd	< 0.1 ppm
8	Lead As Pb	< 0.1 ppm
9	Mercury As Hg	< 0.01 ppm

4.4. Microbial Contamination of Udumbara Jala: -

Table 4.4 Microbial Contamination Observations

Sr. No.	Test Name	Result Obtained
1	Total Fungal count (Yeast & Mold) (CFU/ml)	**01**
2	*E-Coli* / ml	**Nil**
3	MPN Count/ 100ml	**Nil**

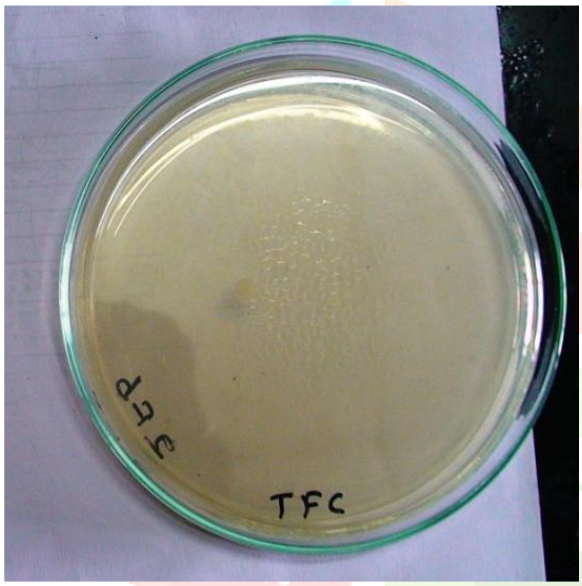

Fig. 12. Total Fungal Count

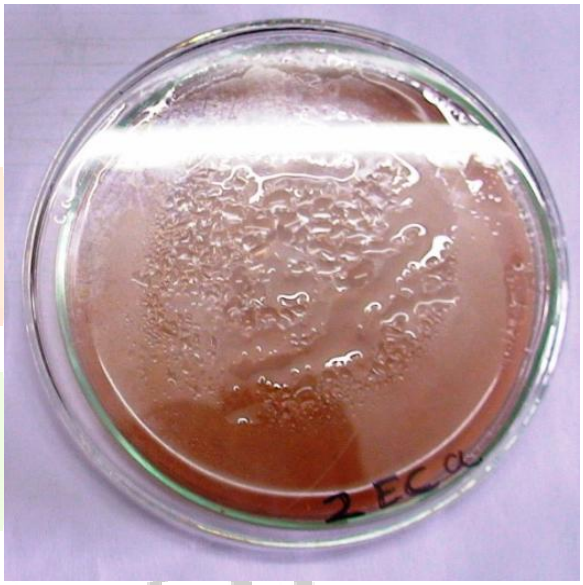

Fig. 13. E-Coli

V. DISCUSSION

Discussion on Selection of Topic:-

The main clause for selecting the topic was Drug i.e. Udumbara Jala (Sap of Root) was very unique. References of Udumbara tree as a whole were widely available in Ayurvedic texts that covered mainly bark, fruits etc. but there was very insufficient information on Udumbara Jala. Also Udumbara Jala was seen to be used in Folklore medicines & Traditional Ayurvedic practitioners in many conditions successfully, but just because of insufficient scientific data it was not recognized globally. Hence topic was chosen cause of its easy availability, cost effectiveness & above all its reorganization both medicinally as well as spiritually.

So the title of study was decided as "PHYTOCHEMICAL AND PHYSICOCHEMICAL ANALYSIS OF UDUMBARA JALA (SAP OF ROOT OF *Ficus racemosa* Linn.)"

Discussion on Collection of Drug (Udumbara Jala): -

Collection of Study drug (Udumbara Root & Udumbara Jala) was one of the most important parts of study as Results were totally dependent on proper sample. Root of Udumbara was collected, Dried, Powdered & send in a non-contaminated - Air tight - Plastic container for lab analysis. Whereas due to unavailability of data for storage & preservation of Udumbara Jala, the collected sample was send for lab analyses within 24 hrs of collection. Size of root was also a major part to consider as too small roots were not giving a proper flow of water; where as too thick root was difficult to cut in proper way so that there was difficulty in collection of sap of Root, also more the thickness of root it was seen, more deeper was their penetration to collect water and minerals. Cutting such roots might have surely caused some ill effects on Plant's Structure & Plant's Physical status.

Procedure used for Collection of Udumbara Jala can be used as a reference tool and can be standardized as a "Method of Collection" for Udumbara Jala as it was adopted after overcoming various practical obstacles without altering basic principals set by Ayurveda for collection of Drugs.

Sap of Root (Udumbara Jala) is available more in trees situated near water sources or reservoirs as compared to trees situated at far & dry places. Medium size root should be used for Collection. Sap of root i.e. Udumbara jala is widely available & can be used in various Disease conditions as those mentioned in Ayurveda & folklore Medicines.

Discussion on Conduction of Analytical Tests: -

Scientific data of Udumbara Root & Udumbara Jala was available after conducting tests like Physicochemical, Phytochemical & Microbial contamination as per norms described in API. It was seen that there were few observations common throughout & some were having variations. These Results can be used as a reference for further studies. For root of Udumbara, TLC was run more successfully in **Mobile phase:** Toluene: Ethyl Acetate: Formic Acid :: 5: 5: 1; as more spots (08) were observed at different Rf values as come pare to other **Mobile Phase:** Toluene: Ethyl Acetate :: 7.5: 2.5 where oniy 05 spots were observed, which might help to conclude that **Mobile phase:** Toluene: Ethyl Acetate: Formic Acid :: 5: 5: 1 is more acceptable when study on udumbara has to be done in future. Also same was the **Mobile phase** used for TLC of Udumbara jala, which was easy for comparing Observations of Udumbara root powder & Udumbara jala.

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Discussions on Observations: -

The present available data of Udumbara comprises of bark, fruit, etc., but there was no scientific data available about Udumbara Root & Udumbara Jala. Data about Root & Sap of root was studied for the first time. The study was done on **Pharmacognosy** which included Macroscopic & Microscopic Characters, Organoleptic Characters of Udumbara Root & Udumbara Root Powder,

Physicochemical analyses which include Determination of Foreign Matter, Loss on Drying, Ash Values, Soluble Extractives, pH, Specific Gravity, Total Solid, Turbidity, Refractive index, Thin layer chromatography (TLC).

Phytochemical analyses included Total Carbohydrates, Proteins, vitamins, Minerals, Heavy Metals.

Microbial Contaminations included Estimation of Total fungal count, E-coli.

The findings like presence of Carbohydrates, Proteins, Minerals & absence of Heavy Metals increases the scope for further research, where TLC, pH, etc. other parameters will serve as guidelines for research work on Udumbara Jala.

Specifically in TLC **Mobile phase:** Toluene: Ethyl Acetate: Formic Acid :: 5: 5: 1; was used in both udumbara root as well as jala. After successful conduction of TLC observations were analyzed thoroughly & it was found that the spots with Rf 0.19, was common in both cases. Where as in study of root 8 more spots were identified with Rf 0.33-0.38, 0.42, 0.63, 0.68, 0.70, 0.77, 0.91.

After discussing the above observations with experts from the field of Dravyaguna, Research, Botany, it can help us to conclude that root of Udumbara & Udumbara jala have one element / compound, probably Sugars or Carbohydrates in common in given conditions of Solvent, mobile phase, etc. whereas Root of Udumbara has 8 more elements or compounds which can be studied in detail in further studies

VI. CONCLUSION

The Conclusion of the study was as follows: -

- The present study gives basic data about reference ranges of various parameters for **Udumbara Jala** for further research.
- Presence of Carbohydrates, Proteins, Amino acids & Minerals.
- No Significance presence of Heavy metals.
- No presence of any Microbial contamination if collected properly.

So, the major outcome of the study was to provide guidelines regarding collection methods Udumbara root & Udumbara Jala & to provide Reference range of Udumbara root & Udumbara jala for further Analytical & Clinical study.

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